MODIS SCIENCE TEAM MEMBER
Quarterly Status Report   (July - Oct 1995)

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a) Task Objectives

The objectives of this phase of the project were: to continue the research program developing the 'at-launch' algorithms for MODIS atmospheric correction, vegetation indices, fire detection and land cover and to build the necessary infrastructure and collaboration to permit the research to be undertaken. The completion of the development of the Beta 3 Code and associated test data sets was given a high priority in terms of time and resources during this period of performance.

As part of an outreach program, the project has developed a number of collaborative activities which are intended to expand the scope of the team members activities and involve a larger scientific community in the MODIS research. Due to the limited number of researchers addressing the issues necessary for the methodological advances needed for MODIS, emphasis has been given to developing collaborative research with groups working in closely related fields and MODIS outreach through the EOS IDS teams, the EOS Pathfinders and the IGBP Data and Information System Core Project. In addition, the goals of the MODIS project, the status of the instrument and preliminary results of the research have been presented at key scientific meetings. The project is also represented at the MODIS technical team meetings, the MODIS support team advisory panels, MODIS Team meeting, appropriate ECS and DAAC meetings. Results of the studies undertaken as part of the project are in the process of being written up and submitted for publication.

b) Tasks Accomplished (Product development)

Specifically the project has addressed the following topics over the last four months:

MODIS Atmospheric Correction:

Since June, we have actively worked on bidirectional reflectance issues as they relate to the MODIS atmospheric correction. We have accounted for an anisotropically reflecting surface in our operational routine by creating lookup tables of the surface-atmosphere coupling terms. For a given land target, the appropriate table elements are determined from the past 16-day MODIS-BRDF product and the current atmospheric optical depth. We are also developing accuracy requirements for bidirectional reflectance
as we evaluate the standard BRDF product. To this end, we are comparing the MODIS BRDF models against more complex and computationally expensive models for providing the coupling terms.   This work includes extensive collaboration with the BU and Montana MODIS teams. By combining bidirectional reflectance with vegetation indices, we have begun to understand the optimal geometries for the formation of vegetation indices.   Results have been been provided to the MODIS vegetation index
team. We are also considering the effects of scale and surface heterogeneity on the MODIS BRDF products. First, we are analyzing the effects of heterogeneity on the inversion of models which assume homogeneity. Second, we are developing methods to deconvolve the reflectance of subpixel homogeneous components such that the derived reflectances can be used in model inversions. The group worked initially on BRDF inversions from remotely sensed data (AVHRR, MODIS Airborne Simulator). BRDFÕs for Desertic sites using AVHRR were successfully modeled using linear and non-linear models. The same result were been obtained for MAS data exhibiting a strong hot-spot over the Eastern United States during the SCAR-A campaign.

Work continues with the Landsat atmospheric correction code for the LTER project and the correction of adjacency effect up to a radius of 20 pixels have been included. The code now processes a full scene in about 2 hours on a HP-735 workstation.

MODIS Land Cover (w. Strahler et al.) **:**

Justice attended the IGBP Land Cover meeting in Montana and presented the options being considered for Land Cover MODIS Test Site validation. The relationship between the IGBP 1km project, the associated validation exercise and the MODIS at-launch product was examined. Emphasis is to be placed on developing global prototypes using the proposed MODIS land cover approaches.

MODIS Fire Detection (w. Kaufman)

Chris Justice and Luke Flynn attended the 2nd IGBP-DIS Fire Algorithm Workshop at JRC Ispra. The MODIS algorithm and prototyping were presented. Community consensus was reached on improvements to the existing GSFC Fire Algorithm in the areas of background temperature

retrieval and emissivity. Prototyping of these improvements will be undertaken at GSFC, prior to generation of an IGBP global 1 km fire product.by JRC. The MODIS algorithm will be developed based on the AVHRR prototyping experience. Emphasis is being placed in three areas of research: refining the at-launch active fire detection algorithm and processing chain, including the total emissions algorithm; developing the flaming and smoldering ratio algorithm (Kaufman and Flynn), and developing the post-launch area burned algorithm (Justice).
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MODIS Vegetation Index:(w. Huete)

Work is proceeding to evaluate the IGBP 1km Vegetation Index product and examine the impact of atmospheric correction on the MODIS V1 compositing process. The refined compositing technique is in preparation for the V1 delivery,.AVHRR data are being used to prototype the V1 for MODIS.

c) Data / Analysis / Interpretation

¥ Modis Beta #3 Delivery:
The group worked on integration of the MODLAND thread with SDST (Beta 3 delivery). Software for level 2 processing (atmospheric correction, fire detection,VI's computation) was delivered on August 15Th. The code processes the LEVEL 1B MODIS Simulated Data Set and produces MOD09,13,14 in HDF format.
The group continued to work on integration of the MODLAND thread with SDST (Beta 3 delivery). Software for level 2G, 3 processing (atmospheric correction, fire detection, VI's computation). Code for Level 2G and Level3 was delivered Mid-September. Level 2 now includes an interface with the BRDF product for Atmosphere-BRDF coupling effect correction. The beta 3 codes for level 2 and level 3 surface reflectance, vegetation index and fire were delivered to SDST along with the necessary test datasets (TM data, MAS data and synthetic data). The team also assisted SDST in evaluating the utility of the SDP Toolkit for this particular processingstring. The utility of the SDST MAPI was also evaluated. A report was given at the SDST SAP meeting.
The Level 2G gridding code was proposed and developed and tested in collaboration with Robert Wolfe SDST. A preliminary version was dlivered as part of the Beta delivery.

Continued analyses of AVHRR, MAS and Landsat TM data were performed as part of the MODLAND prototyping effort

Work continues on establishing ATM Network connectivity between the project SCF and the EDC LAND DAAC. Trial transmission using the ATM is planned for early December. Four ten day periods of 1km data (stitched orbits) will be sent as part of the first phase. Video conference capabilities using the ATM are also being evaluated.

d) Meetings
Justice and Vermote attended the SDST Review (July 17-19). Emphasis was placed on developing the lessons learned from the early stages of the Beta 3 delivery.
Justice (chair) and Vermote attended the SDST Science Advisory Panel Review.
Justice attended the IGBP BAHC Land Cover Meeting in Montana (Sept 5-7)
Justice attended the MODIS session at the MODIS snow/ice workshop (Sept 14)
Justice attended the EOS Airborne Workshop providing input on the MODIS requirements for new airborne sensors (Oct 3-5)
Justice met with SADC Food Security representatives to discuss the feasibility of using MODIS data for near real time drought monitoring.
Privette presented the current results on the atmosphere/BRDF coupling research at the Europto Remote Sensing II Meeting in Paris.
Privette attended a one day MODLAND BRDF meeting in Boston.

¥ Upcoming Meetings
Justice has initiated and developed the preliminary agenda and attendees list for the EOS Test Site meeting to be held in January.
The project will be represented at the MODIS team meeting in November.
Vermote will attend the Calibration SAP meeting to be held in January
The MODLAND/SDST meeting on V1 is planned for February.

Papers in Preparation

Wolfe and Vermote - Level 2G Code